



MSFC SHUTTLE PROBLEM REPORTING AND CORRECTIVE ACTION SYSTEM (PRACA): Organizations, Requirements and Implementations

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AGENDA

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1. OVERVIEW (1 of 4)

➤ Concepts

- Certain nonconformances and discrepancies are of sufficient significance to require formal notification, review, and sign-off approval by S&MA and the CoFR signatory (such as the respective Design Center Project Manager).
- Significant problems have the potential to adversely affect safety of flight and/or mission success.
- The Shuttle Program needs visibility into significant problems in order to perform independent and cross-Center analyses of risk, safety, and reliability and to assure accurate, consistent application of problem reporting requirements.
- No significant problem should be open against a mission at the time of launch.
- Problems may be dispositioned completely through corrective action (making a change to preclude recurrence of the problem) or explanation (no change but thorough analysis of why a change is not necessary).
- Problems may be dispositioned temporarily by specific activities to preclude the known discrepancy from the involved mission hardware or as an understood acceptable risk.

1. OVERVIEW (2 of 4)

➤ History

- MSFC Problem Assessment System (PAS) established in 1978 at direction of Center Director
 - Internal MSFC system operated for benefit of MSFC Shuttle Projects
- InterCenter PRACA Guidelines were baselined in 1982 by PRCB action
- Shuttle PRACA Problem Reporting Requirements established in 1986 in response to 51L Challenger incident (after several years of PRACA InterCenter Working Group coordination)
 - Defined reportability requirements across Shuttle Centers
 - Defined problem disposition processing across Shuttle Centers
 - Defined standardized codes for use by Shuttle Design Centers
 - MSFC contracts were defined to “meet the intent” of Shuttle PRACA
- InterCenter PRACA Data System established as mandatory for STS-26R return-to-flight – Accomplished in 1988
 - Provided general visibility to problems and problem dispositions by Shuttle Program Office and other authorized organizations
 - Supported by daily data updates from Center PRACAs to Integrated Problem Assessment System (IPAS) housed on JSC IBM mainframe computer
- MSFC Projects required to meet the requirements of Shuttle PRACA by PRCB action in 2000 by NSTS 08126 Rev H
- Rev J Currently in Review: Redefining In-Flight Anomalies and reportability

1. OVERVIEW (3 of 4)

➤ Documents

- NASA Space Shuttle Program [Reference URL: <http://sspweb.jsc.nasa.gov/pdcweb/pdc.cfm>]
 - NSTS 5300.4 (1D-2) *Safety, Reliability, Maintainability, and Quality Provisions for the Space Shuttle Program*
 - NSTS 07700 *Space Shuttle Program Definitions and Requirements*
 - NSTS 08126, Rev H *Space Shuttle PRACA System Requirements*
 - *DRAFT NSTS 08126, Rev J Change Request CR S062082D [coming soon]*
- MSFC [Reference URL: https://msfcsma3.msfc.nasa.gov/tech/pac/s_mapac.html]
 - S&MA OI QS10-R-005 *Failure Reporting Analysis and Corrective Action System (FRACAS)*
 - Contract NAS8-00179, DRD 875MA-006 *Operations Plan, Problem Assessment Center*
- Space Shuttle Prime Contractors
 - Reliability and Quality contract requirements and DRDs
 - MSFC-Approved Problem Reporting Implementation Plans

1. OVERVIEW (4 of 4)

➤ Involvements

- At contractor / subcontractor / KSC USA
 - Discrepancy / nonconformance writer
 - Quality Engineering
 - PAS coordinator
- At MSFC
 - HEI PAC and Information Systems
 - QD20 Shuttle S&MA
 - Project Chief Engineer et al (ED)
 - Project Manager (MP) & Propulsion Systems Engineering & Integration (PSE&I)
- At JSC
 - Space Shuttle Program Office SSP MX
 - SSP S&MA MX (Nancy Currie, Don Totton, Jim Schultz, etc)
 - SSP S&MA NX (Roy Glanville, David Dyer, etc.)
 - USA Data Integration (Margaret Guardia, Mark Browne, etc.)
- Throughout NASA community
 - Researchers / Trenders / Data Miners (including NESC et al)
 - Prime and support contractors

2. TERMS (1 of 5)

➤ **Problem Assessment Center (PAC), Problem Assessment System (PAS), and Problem Reporting and Corrective Action (PRACA)**

- PRACA refers to either the significant problem reporting requirements or the data base in which those problems are recorded and maintained at the Shuttle Centers.
- The PAC is an organization within the S&MA Support Contract that coordinates PRACA reporting activities for MSFC.
- The PAS includes all systems, organizations, and processes within MSFC, MSFC support contractors, and MSFC hardware contractors involved in PRACA.

The PAC is the part of the PAS which coordinates and maintains PRACA for MSFC.

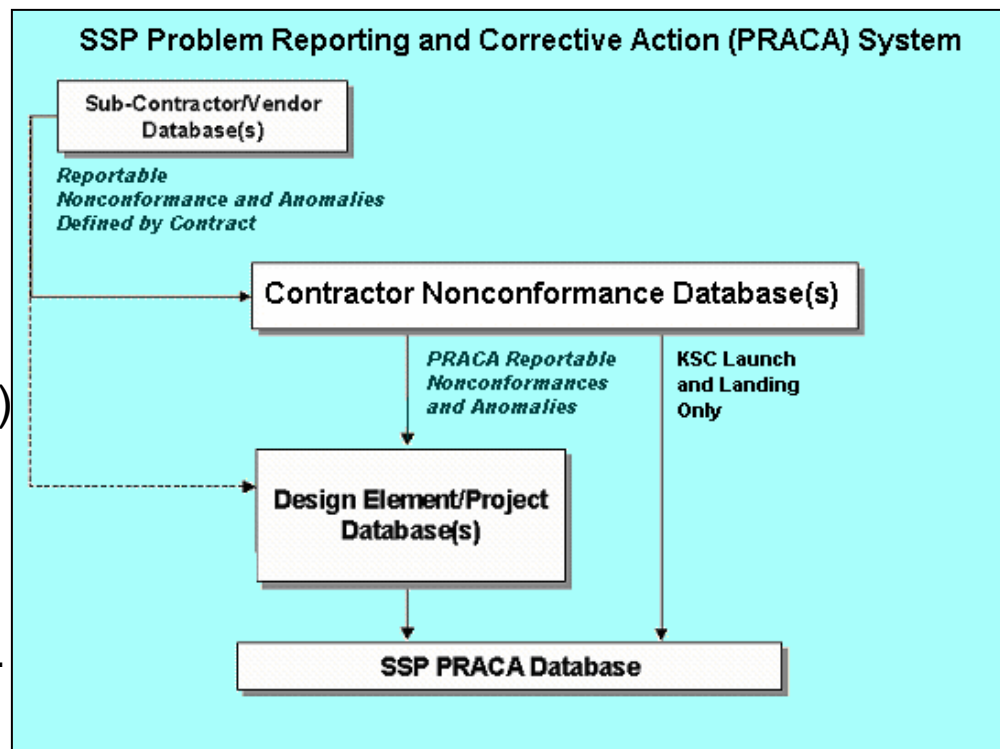
➤ **Remedial Action, Recurrence Control, and Corrective Action**

- Remedial action is action performed to correct the problem on the specific piece of hardware that experienced or indicated the problem situation.
- Recurrence control is action taken to prevent repeated occurrence of the issue on the part having the problem and other similar components.
- Corrective action is action beyond remedial action to correct a problem and prevent/control problem recurrence in existing and/or future hardware or software.

2. TERMS (2 of 5)

➤ KSC, MSFC, and JSC Shuttle PRACAs

- *KSC Shuttle PRACA* is mainly a system to document and disposition nonconformances through remedial action so that acceptable units may be assembled for flight. KSC Shuttle PRACA does not distinguish between simple nonconformances and PRACA-reportable problems.
- *MSFC Shuttle PRACA* is mainly a recurrence control system seeking to document and resolve issues pertaining to design or processing flow. MSFC nonconformance remedial action documentation and processing is normally performed by the contractor separate from MSFC's Design Center PRACA.
- *JSC Shuttle (Orbiter) PRACA* is a USA-operated system which performs both the nonconformance processing functions of a hardware contractor (Contractor Corrective Action Reports C-CARs) and the recurrence control functions of a design center (Team CARs T-CARs) through formal Problem Resolution Teams (PRTs)
- *JSC Government Furnished Equipment (GFE) PRACA* is a USA-operated system mainly operating in a recurrence control mode for common hardware components used throughout both Shuttle and Station.



2. TERMS (3 of 5)

➤ **Nonconformance, Failure, Discrepancy, Anomaly, Unsatisfactory Condition, Reportable Problem**

- A *nonconformance* is a lack of compliance with a requirement (dimension, performance, or some other parameter). It includes failures, discrepancies, defects, and malfunctions.
- A *failure* is the inability of a component or system to perform its specified function within specified limits under specified conditions for a specified duration.
- An *anomaly* is an unexpected event, hardware or software damage, departure from established procedure or performance, deviation, or performance outside of certified design/performance specifications.
- An *unsatisfactory condition* is a any defect for which engineering resolution is required AND which requires recurrence control beyond the specific article where the issue was found/indicated –i.e., it can't be corrected to specification using an established, approved standard planned operation.
- A reportable problem is a nonconformance or anomaly which is required to be reported to PRACA.

➤ **Funnies, Squawks, and In-Flight Anomalies (IFAs)**

- *Funnies* are unusual occurrences during flight
- *Squawks* are nonconformances or unsatisfactory conditions during flight
- An *IFA* is problem that occurs or is identified on the in-use flight hardware/ software from cryogenic tanking through the end of the design element/project's mission cycle (splashdown or engine cut-off, for example) that meets one of the standard PRACA reportability screens, did or could have affected crew safety, did or could have affected successful mission completion, did or could have caused launch scrub or abort, caused a delay preventing planned T-0 launch, &/or violated flight crew on-orbit scheduling constraints

IFAs are declared by the Project; reported to the Mission Management Team (MMT), Systems Integration Control Board (SICB), and PRCB; and presented to the PRCB for possible follow-on actions and/or future flight constraint determination.

2. TERMS (4 of 5)

➤ Failure Mode Effects Analysis (FMEA) and Critical Items List (CIL)

- The FMEA is a document written to analyze how systems and components can fail (all failure modes) and the worst possible effects of the failure. For MSFC Shuttle purposes, the FMEA classifies the failure as one of the following, based on NSTS 22206 rules:
 - Crit 1 – Loss of this function will result in loss of life or vehicle
 - Crit 1R – A redundant item for which the loss of all redundant functions will result in loss of life or vehicle
 - Crit 3 – The loss of this function and all redundant functions will not result in loss of life, vehicle, or mission
- The CIL records all items having a Crit 1 failure mode, a Crit 1R with only a single redundancy, or becomes Crit 1 during an intact abort

➤ Worst Case and Functional Criticalities

- Worst Case Criticality is the categorization of the LRU or component based on all of its FMEA/CIL failure modes
- Functional Criticality is the categorization of the effect of loss of all redundancies for the given function (based on the FMEA failure mode)

2. TERMS (5 of 5)

➤ In-Family and Out-of-Family

- In-family problems have been previously experienced, analyzed, and are understood. Generally, these can be exempted from reporting into Design Center PRACA upon specific approval of the Program or Project Office.
- Out-of-family problems are new, different, worse-case, and/or significant anomalies or unsatisfactory conditions and/or adverse or unexplained conditions or trends generally requiring engineering analysis for resolution. Out-of-family problems are reportable to Design Center PRACA.

Except for USA-Ground Ops sign-off rules, these distinctions are removed in Rev J.

➤ Nonconforming Article (NCA), Line Replaceable Unit (LRU), and End Item Model (EIM)

- The NCA is the lowest component or piece-part that was nonconforming or anomalous and caused the reportable problem.
- The LRU is the smallest single item which can be removed and replaced as a unit from the system at the organizational level of repair or the lowest level listed in the FMEA. Problem isolation generally means that the root cause of the failure has been determined to be within a particular LRU.
- The EIM is the total hardware system delivered and bought-off by the government (for example, a tank, engine, motor segment, or booster). Sometimes, reportable problems are determined on a hardware component prior to its incorporation into an EIM.

Problem reporting is generally to be performed at the LRU or NCA level; however, all of these fields are welcomed and acceptable into PRACA.

3. PROBLEM REPORTABILITY (1 of 2)

➤ Hardware Phase (NSTS 08126)

- On certified flight or flight-like hardware or software from qualification testing through the component life cycle:
 - Qualification / certification testing **
 - Acceptance Testing
 - Assembly and integration
 - In-flight/on-orbit/post-flight data reconstruction
 - Turn-around, including ground test, overhaul, repair, and repair
 - Shipping and receiving of flight or flight-like hardware delivered to the government
 - If indicates the integrity/functional capabilities of previously accepted/delivered flight or flight-like hardware

**** NOTE:** *Prior to acceptance testing, reportable problems only occur where the failure or unsatisfactory condition does or has the potential to adversely affect safety, contribute to schedule impact or launch delay, or result in design change.*

3. PROBLEM REPORTABILITY (2 of 2)

NSTS 08126 Rev H (current)

Nonconformances, NASA ALERT's, or anomalies that meet the criteria below are defined as reportable and entered in the Design Element PRACA database:

- 1) All nonconformances and anomalies that occur on flight or flight-like hardware which affect functional capability, or result in overstress, an unsatisfactory condition, or an unexplained anomaly
- 2) Orbiter flight software discrepancies (post release for flight);
- 3) SSME software discrepancies;
- 4) Nonconformances on LPS, L&L facilities, and GSE that meet the Design Element's criteria for reportable as defined in Design Element's requirements;
- 5) Failures of CIL hardware that fail in critical failure modes.

NSTS 08126 Rev J (proposed)

The criteria below define a PRACA reportable problem:

- a. All nonconformances* and anomalies* that occur on flight or flight-like hardware that is:
 1. a failure*
 2. an overstress or a result of an overstress* of equipment and/or material
 3. an unsatisfactory condition*
 4. an unexplained anomaly*
 5. ALERT* applicable to flight hardware

*see Appendix C for definitions

- b. Orbiter flight software (FSW) discrepancies (post release for flight).
- c. SSME software discrepancies.
- d. Nonconformances on Launch Processing System (LPS), L&L facilities, GSE, and Space Shuttle flight operations software, facilities, procedures, and processes that meet the design element/project's criteria for reportable, as defined in design element/project's requirements.
- e. Failure of Critical Items List (CIL) hardware that fail in critical failure modes.
- f. Any problem recommended by the responsible design element/project.

4. REPORTING REQUIREMENTS (1 of 2)

➤ **Timing (NSTS 08126)**

- Into contractor nonconformance system within 1 working day of occurrence / detection
- If reportable, to Design Center PRACA within 5 working days of isolation to LRU or within 21 calendar days from occurrence / detection if not yet isolated (or by contract, if less)
- After FRR, to Design Center PRACA as soon as possible, but no later than 1 working day from detection if potentially affects flight, crew safety, or mission success
- To Design Center PRACA prior to launch if problem occurs pre-launch

➤ **Data Delivery Techniques**

- Via electronic transfer highly encouraged
- Current electronic methods are:
 - Via PCASS direct table update transfer format for SSME and ET
 - Via electronic mail (in Word format) & fax from SRB and RSRM

4. REPORTING REQUIREMENTS (2 of 2)

➤ Required Data Fields

- Contractor-provided information includes:
 - Unique contractor problem identifier(s)
 - Part information (LRU, NCA, EIM name, part number, serial number, manufacturer)
 - Criticality and FMEA (& Hazard Report, per Rev J) reference
 - Certain dates (when failed, when isolated, when intended to be resolved)
 - Problem description (what happened, when and where it happened, what was going on at the time, how it happened, and how it differs from intended results)
 - Analysis and disposition recommendation with rationale
 - Effectivity
 - Process escape and CIL Retention Rationale Impact indications
- PAC-provided information includes:
 - Unique MSFC problem identifier(s)
 - Problem title
 - MSFC actionees
 - MSFC response / approval statements
 - Conversion of information to coded information
 - Certain dates (when received, when closure submitted, when disposition approved, effectivity of approved disposition)

5. DISPOSITION (1 of 2)

- All MSFC PRACA problems must be dispositioned prior to mission
- Interim Closure – A temporary disposition in which continued safe use of hardware during development of full resolution is justified.
 - Flight Rationale: Preferably specifically citing at least one of the following, but at least speaking to it / them –
 - The problem is not applicable to the flight(s) (i.e., system not installed and/or used on the flight).
 - The problem condition is clearly screened during preflight checkout or special tests.
 - The problem is time/age/cycle related and the flight units will accumulate less than 50% of the critical parameter(s) by the end of the flight.
 - There is no indication of a generic problem.
 - There is no overall safety of flight concern. *[The potential failure mode(s) associated with this problem could not result in a critical or catastrophic effect (i.e., it has only functional criticality 3 failure mode(s)) -- per Rev JJ].*
 - The problem is applicable to the flight(s) (system used during flight); however, the PRCB agrees that sufficient evidence exists that the system can be flown safely (acceptable risk).
 - Plan of action (PoA) to analyze issues and develop full closure rationale
 - Effectivity (by date range and/or hardware sets) of Interim Closure

5. DISPOSITION (2 of 2)

➤ **Launch Mode / Launch Imminent Interim Closure**

- Interim closure during the week prior to launch in which time does not permit development of a full PoA with schedule for analysis, but where interim disposition until an agreed-to time after the mission (~2 weeks) is approved based solely on flight rationale.

➤ **Full Closure**

- Must include
 - Cause or causes, or most likely cause if none determinable
 - Remedial or corrective action, or rationale why no corrective action is required
 - In no corrective action is required, consequences of problem occurrence during service and any work-arounds or counter-measures

➤ **MSFC Review / Approval**

- Basic coding and data integrity/consistency/logic performed by PAC
- Review/approval of engineering, risk, and adequacy of rationale by Design, Chief Engineer, S&MA, and Project Manager
- Project Manager disposition approval required for all Crit 1 and 1R functions
- Project Manager may delegate closure approval of lower criticality problems
- Problem review may be performed sequentially [ET, RSRM, & SRB] or in a Problem Review Board (PRB) [SSME]

6. RESPONSIBILITIES (1 of 4)

➤ **Space Shuttle Program (SSP) Office**

- Establish and maintain SSP PRACA policies and requirements.
- Assure appropriate management reporting procedures are defined and implemented.
- Provide overall management for the SSP PRACA database.
- Provide PRACA data accessibility for independent assessment.
- Direct/participate in PRACA process audits to assure Element and Project Office compliance with these requirements.

➤ **SSP Safety and Mission Assurance (S&MA) Office**

- Provide technical advice and support to the Manager, SSP with regards to PRACA requirements and implementation.
- Assure PRACA requirements are maintained current with SSP policy.
- Direct/participate in PRACA process audits.
- Define SR&QA requirements for the SSP PRACA database.
- Advise the SSP Manager to the risk decisions related to problem resolutions and trends.
- Define training requirements to maintain awareness by project offices.
- Coordinate and integrate results on common hardware across other projects.

6. RESPONSIBILITIES (2 of 4)

➤ MSFC Shuttle Project Offices

- Implement element PRACA systems consistent with the requirements in NSTS 08126 and develop implementation plans.
- Participate in PRACA process audits.
- Perform surveillance on selected PRACA reportable problems and/or processes to assure compliance with SSP requirements.
- Coordinate/integrate PRACA results for common hardware across other program elements.
- Disposition all PRACA-reportable problems prior to use or flight of that design.
- Integrate PRACA results into other program operations including Launch Commit Criteria (LCC), flight rules, FMEA/CIL, hazard analyses, maintenance and logistics requirements, etc.
- Implement element PRACA data systems consistent with the requirements.
- Assure S&MA participation as an integral part of project PRACA activities.
- Participate in PRACA training

6. RESPONSIBILITIES (3 of 4)

➤ **MSFC S&MA Shuttle Project Assurance Teams**

- Concurrence on element PRACA requirements and procedures.
- Concurrence on element PRACA reportable problem criteria and problem screening criteria.
- Provide recommendations on reportable problem dispositions.
- Perform PRACA process audits.
- Verify PRACA results are coordinated with other risk management activities such as FMEA/CIL analyses, hazard analyses, and the program preventive/corrective action review (P/CAR) process.
- Provide training to MSFC project offices
- Participate in nonconformance and problem resolution teams involved PRACA PRs.

➤ **Space Shuttle Systems Engineering & Integration (SE&I) Office**

- Maintain integrated IFA list during real-time mission operations for the MMT
- Perform a technical review all IFAs post-mission and pre-PRCB IFA review
- Define common hardware across projects and provide list to SSP S&MA

6. RESPONSIBILITIES (4 of 4)

➤ MSFC PAC

- Receive, review, code, screen for system level applicability, and maintain complete record of incoming problem reports.
- Coordinate activities of the MSFC PAS
- Provide official MSFC problem report data to authorized organizations and personnel
- Operate and maintain the MSFC PRACA database application and contents
- Conduct on-going statistical analysis and engineering assessment of problem trends

➤ Contractor

- Accurately record basic information on problems and nonconformances in the contractor nonconformance data system(s)
- Provide NASA visibility into the contractor nonconformance data system
- Screen nonconformances for PRACA reportability and report those which are PRACA reportable to the MSFC PAC in accordance with contract and NASA problem processing requirements
- Offer disposition recommendations for MSFC review and approval in a timely and accurate manner that fully supports the launch schedule and launch preparation milestones
- Develop and follow an MSFC-approved problem implementation plan documenting the processes used by the contractor to fully comply with contract and NASA problem processing requirements

7. SYSTEM CHANGES/IMPACTS EXPECTED FROM NSTS 08126, "SHUTTLE PRACA" REV J

➤ **MSFC Projects**

- Increase in problem reporting across-the-board
- Increased IFA count and briefings across-the-board
- Implementation of Hazard Report Reference data field
- Rewrite of PRACA implementation plans
- More "increased risk" reporting to SSRP due to increased sensitivity

➤ **SSME**

- Increased analysis for Interim Dispositions due to elimination of "no safety of flight concern" criteria

➤ **SRB – USA-SRB**

- Reporting of anomalies post analysis (as opposed to at initial documentation) determined to have been caused by overstress or an unsatisfactory condition

➤ **RSRM – Thiokol**

➤ **ET – LMMSS**

- Reporting of non-Functional Criticality 1/1R failures

8. USES OF PRACA

➤ By MSFC

- To assure formal tracking and resolution of critical hardware and software problems
- To inform Shuttle Program Office of critical problem status, through data provided through WebPCASS and at COFRs/PARs
- To evaluate compliance of contractors with contractual and NASA reporting requirements
- To perform high level trending and problem history reviews in association with:
 - Support for evaluation of recommended analyses and recurrence controls
 - Effectiveness of past recurrence control activities
 - Identification/justification of areas (systems, subsystems, components, etc.) needing redesign

➤ By Shuttle Program Office

- To perform high level trend and problem history reviews
- To evaluate effectiveness and accuracy of problem system implementations
- For independent evaluation of Shuttle risk and risk management

9. NASA SHUTTLE DATA SYSTEMS OVERVIEW

➤ **Space Shuttle Program Technical Data WebPCASS**

- Provides access to Shuttle Center common PRACA data from JSC Orbiter and GFE, KSC, and MSFC, as well as CILs, Critical Hardware Lists, Hazard Reports, Waivers, and In-Flight Anomalies, at URL:

<http://usa1.unitedspacealliance.com/hq/warehouse/ssp/>

➤ **MSFC UNIX PRACA**

- Provides access to all MSFC problem report data at URL:

<https://praca.msfc.nasa.gov/praca/review/public/html/index.html>

➤ **MSFC PAC Home Page**

- Provides access to various MSFC and NASA PRACA requirements and implementation plans, data summaries, and contacts information, at URL:

https://msfcsma3.msfc.nasa.gov/tech/pac/s_mapac.html

➤ **KSC PRACA in SPDMS2 on IMIC Mainframe Host KSC12 or D12VM**

- Provides access to KSC Shuttle and tile problems, CAAR, administrative, and In-Flight Anomaly (IFA) data with on-line query and off-line batch report options

➤ **JSC Orbiter PRACA Data Support System (PDSS)**

- Provides access to Orbiter PRACA problem and processing information at URL:

<http://hou-web02.jsc.nasa.gov/sfoc/orbiter/pac/>

MSFC PRACA : 2000-10-30 09:02

MSFC Problem Reporting and Corrective Action (PRACA) System

WHOLE RECORD REPORT(+ ADDENDUM)

MSFC Record # (*)	In-Flight Anomaly Number	Contractor Report Number (*)	JSC#	KSC#
Problem Title (\$)				
EICN#	ELEMENT (*)	Contractor (\$)	FSCM#	FCRIT (\$)
HCRIT	Sys_Lvl	Misc Codes	ABCDEFGHIJKLMNO	
HARDWARE EIM	NOMENCLATURE (+)	PART# (+)	SER/LOT#	MANUFACTURER
HARDWARE IIRU	NOMENCLATURE (+)	PART# (+)	SER/LOT#	MANUFACTURER
HARDWARE NCA	NOMENCLATURE (+)	PART# (+)	SER/LOT#	MANUFACTURER
Test/Operation (\$)	Prevailing Condition (\$)	F / U (\$)	Fail Mode (\$)	Cause (\$)
System (*)	Defect (\$)	Material (\$)	Work Contact (\$)	Fail Date (\$)
Received at MSFC (*)	Date Isolated (\$)	FMEA Reference (\$)	IFA: Mission Phase	Mission Elapsed Time
Location (\$)	Symptom (\$)		Time Cycle	
Effectivity Text				
Vehicle Effectivity Codes				
Vehicle 1	Vehicle 2	Vehicle 3	Vehicle 4	Vehicle 5
Mission Effectivity Codes				
Mssn 1	Mssn 2	Mssn 3	Mssn 4	Mssn 5
Estimated Completion Dates				
F/A Date	LVL 4 Close	LVL 3 Close	Remark / Action	
Investigation / Resolution Summary				
Last MSFC Update (\$)	CN RSLV SBMT (\$)	Defer Date	Add Date (\$)	R/C Codes (\$)

Assignee				
Design (\$)	Chief Engineer (\$)	S & MA (\$)	Project	Project MGR (\$)
Approval				
Design (@)	Chief Engineer (@)	S & MA (\$)	Project	Project MGR (@)
PAC Assignee (\$)	PAC Review Complete (\$)	MSFC Closure Date (\$)	Status (*)	F/A Completion
Problem Type	SEV	Program Name	REVL	OPRINC
FUNC MOD	Software Effectivity	Software Fail CD	SUBTYPE	Software Closure CD
RES PERSON L2	Approval Signature L3			
Related Document Type	Related Document ID			
Related Document Title				
Contractor Status Summary				
Reliability/Quality Assurance Concerns, Recommendations:				
Problem Description (\$)				
Contractor Investigation/Resolution (\$)				
MSFC Response/Concurrence (\$)				

COLOR (SYMBOL) CODE	MEANING TRANSLATION
(*) --	- FIELD DATA REQUIRED FROM INITIAL REPORT
(\$)--	- FIELD DATA EXPECTED BY PROBLEM FULL CLOSURE
(+)--	- DATA IN AT LEAST 1 OF THE 3 PART LEVEL SETS REQUIRED BY PROBLEM FULL CLOSURE
(@)--	- FIELD DATA REQUIRED BY PROBLEM FULL CLOSURE EXCEPT FOR NON-PROBLEMS
--	- FIELD DATA OPTIONAL

➤Date Fields (continued)

MSFC Problem Reporting and Corrective Action (PRACA) System
ASSESSMENT ADDENDUM REPORT

SFC Report# (*)	IFA#	Contractor RPT# (*)	JSC#	KSC#	EICN#
Asmnt Part# (\$)	Asmnt Part Name (\$)	Asmnt Serial/Lot#			
FCRIT CD	FCRIT CD (\$)	CAUSE CD (\$)	FAIL MODE (\$)		
Asmnt FMEA (\$)	Asmnt FM	FMEA CSE	FMEA SCSE		
Asmnt FMEA	Asmnt FM	FMEA CSE	FMEA SCSE		
Asmnt FMEA	Asmnt FM	FMEA CSE	FMEA SCSE		
Correlated Part#	Correlated Part#	Correlated Part#			
Associated LRU#	Associated LRU#	Associated LRU#			
MAJOR DESIGN CHANGES					
RV DATE	DESCRIPTION OF CHANGES				
ASSESSMENT TEXT					

COLOR (SYMBOL) CODE	MEANING TRANSLATION
	= FIELD DATA REQUIRED FROM INITIAL REPORT
	= FIELD DATA EXPECTED BY PROBLEM FULL CLOSURE
	= DATA IN AT LEAST 1 OF THE 3 PART LEVEL SETS REQUIRED BY PROBLEM FULL CLOSURE
	= FIELD DATA REQUIRED BY PROBLEM FULL CLOSURE EXCEPT FOR NON-PROBLEMS
	= FIELD DATA OPTIONAL

➤MSFC UNIX PRACA Codes

MSFC PRACA / NSTS STANDARD 08126G, APPENDIX A, DATA CODES

Rev 03/14/01

CAUSE										E/H CRIT	
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	1	2*
D	DESIGN	DHV	DES-HDW-VIBR	ETP	EI-TEST-INST	MMT	MFG-MOV-EQUIP	MT	MFG-TST	1A	2P
DH	DES-HDW	DHS	DES-HDW-WORK	ETT	EI-TEST-EQUIP	MMW	MFG-MOV-WORK	MTE	MFG-TST-ENVR	1R	2S
DHA	DES-HDW-AGE	DS	DES-SFT	ETW	EI-TEST-WORK	MN	MFG-ISP	MTF	MFG-TST-INST	1H	3
DHC	DES-HDW-LIFE	E	INDUCED	M	MANUF	MNE	MFG-ISP-ENVR	MTT	MFG-TST-EQUIP	1+	3R
DHE	DES-HDW-ENVR	EIC	EI-CONTAM	MA	MFG-ASY	MNP	MFG-ISP-INST	MTW	MFG-TST-WORK	1#	3A
DHF	DES-HDW-FLOW	EOE	EMI	MAE	MFG-ASY-ENVR	MNT	MFG-ISP-EQUIP	S	SOFTWARE	1S	3B
DHH	DES-HDW-HFAT	ES	EI-SHIP	MAP	MFG-ASY-INST	MNW	MFG-ISP-WORK	U	UNKNOWN	2	3C
DHL	DES-HDW-LFAT	ESE	EI-SHIP-ENVR	MAT	MFG-ASY-EQUIP	MP	MFG-PRC	UA	UNK-ONE	2A	4
DHM	DES-HDW-CHEM	ESP	EI-SHIP-INST	MAW	MFG-ASY-WORK	MPE	MFG-PRC-ENVR	UF	UA-FLIGHT	2B	*PR
DHO	DES-HDW-LOAD	EST	EI-SHIP-EQUIP	MM	MFG-MOV	MPP	MFG-PRC-INST	UK	UNK-NO-INV	2R	+HR
DHP	DES-HDW-INST	ESW	EI-SHIP-WORK	MME	MFG-MOV-ENVR	MPT	MFG-PRC-EQUIP	UN	UN-NONFLIGHT	2#	*HR
DHT	DES-HDW-THRM	ET	EI-TEST	MMP	MFG-MOV-INST	MPW	MFG-PRC-WORK	Z	NONE	2S	\$-BR
		ETE	EI-TEST-ENVR								

DEFECT		FAILURE MODE OR SYMPTOM						RELATED DOCUMENT		STATUS			
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT		
CE	EXTRA	MI	STRESS	EAF	FAILS OFF	EMI	EMI	MA	FAILS OFF	AS	ATP-SCREEN	O	OPEN
CN	CONTAM	MW	MISWR	EAN	OUTPUT LOSS	EN	OPEN	MB	FAILS ON	A1	ALERT RECVD	M	OPEN-M
CR	CORROD	PA	ELECK	EB	FAILS ON	EQ	OUTPUT ERROR	MC	PREMATURE	A2	ALERT SENT	R	OPEN-R
CX	VOID	PB	HERGRS	EC	PREMATURE	ET	MEAS ANOMALY	MD	DELAYED	BX	HEN REPORTS	C	CLOSED
DA	ROUGH	PC	HERFIN	ED	DELAYED	EV	NOT-TO-SPEC	ME	RANDOM	C	CIL REFERENCE	E	CLOSED-E
DB	BENT	PE	VOID	EED	ERRATIC DATA	EVA	VEL LIMIT	MF	INTERMITTENT	CX	CHICK RPT	N	CLOSED-N
DC	BROKEN	PF	MIGRTN	EE	RANDOM	EV	RES LIMIT	MMB	BIND OR JAM	EC	CR/CEP/RECP	P	CLOSED-P
DD	DETACH	PG	IMG	EES	ERRATIC OP	EVC	AXIS ALIGN	MMR	RUBIFRET	HA	HAZARD RPT		
EM	ELADJ	PK	PRCLE	EF	INTERMITTENT	EVD	BIAS DRIFT	MQ	VIBRATION	LC	LGC CHAN NUM		
EP	ELVAL	PL	CHEM	EG	SIG HI OR LO	EVE	SCALE FACTOR	MP	FAILS OPEN	MR	MAT REV BRD	1	POTENTIAL
ER	EL PIN	PP	TEMP	EH	BIT ERROR	EVF	SLEW ERROR	MQ	FAILS CLOSED	NC	PROB RPT		LOSS LIFE
ES	ELSTRS	PQ	TIME	EI	HALTANTRPT	EVG	ANGLE ERROR	MR	TORQUE HILO	RE	CROSS-E		OR CNTRL
ET	ESD	PR	WRONG	EJ	WAVEFORM	EVH	PARAMET DEV	MS	STRUCT	WA	WAIVER	1N	REDNDNT1
HD	OVRHTD	PS	OPEN	EJB	BANDWIDTH	EWJ	BITE IND	MSI	INSULATION	WC	WAIVER,CIL	2	POTENTIAL
HS	TEMSEN	PT	SHORT	EJN	ISOLATION	EVK	BITE ERROR	MT	PITHI OR LO	WD	WAD		LOSS OF
MA	ME ADJ	PU	SMEAR	EJR	RADIAT PAT	EVL	FAILURE ID	MU	MECH TOLRANCE	WM	WAIVER,OMRSD		MISSION
MB	TORQUE	PK	PRT OK	EJV	VSWR	EVM	CONMEG FAIL	MV	EXT LEAK	XM	EXCEPTION	2N	REDNDNT2
MC	MISFIT	PW	DIMEN	EK	OUT-OF-PHASE	EVN	SERVINTIMS	MW	INT LEAK	ZA	CO REVIEW	3	SEEN BUT
MD	M SIZE	PZ	EEE	EKS	SYNC LOSS	EVP	ELEC TOLRNC	MX	FLOW ANOM	ZB	CO REJECT		NO IMPACT
ME	WORN	XA	NOFA	EL	SHORT			MXC	FLOW ANOM/ CV	ZZ	PV-FCP	4	NOT SEEN
ML	AGED	XB	NOFAP	EM	ELECT LEAK	UC	UNSAT					5	NOT SEEN
MM	MISSIN	XN	NA			ZZ	NO PROBLEM						PHILOSOPHY
MT	TYPE W	XU	UNK										/STANDARD

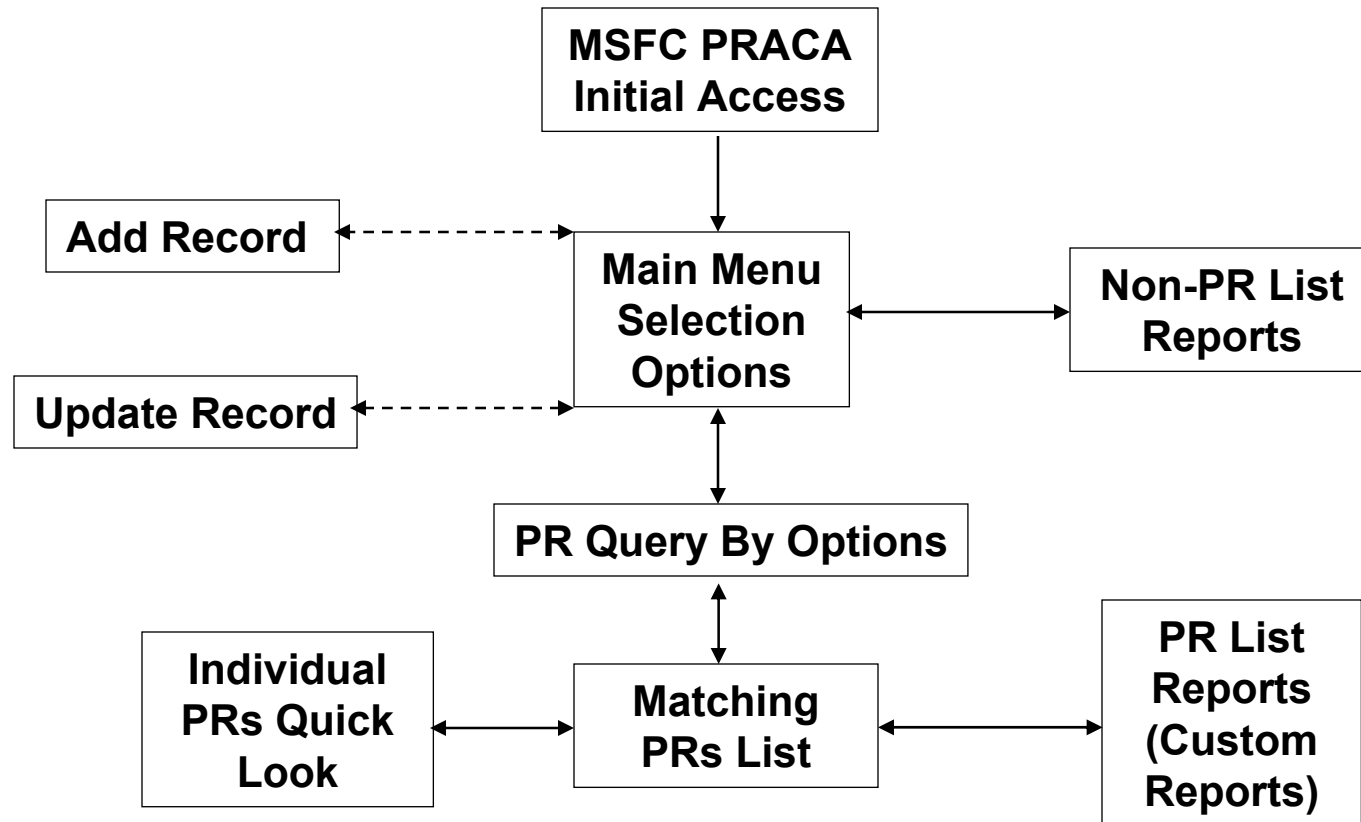
SOFTWARE CLOSURE CODES				S/W FAILURE CAUSE			
IN	DESCRIPTION	IN	DESCRIPTION	IN	DESCRIPTION	IN	DESCRIPTION
1A	SUFFICIENT DATA	3F	USER NOTE REQUIRED	7A	NO ACTION REQUIRED	BC	COMPUTATION
1B	INSUFFICIENT DATA	3G	USER GUIDE NOTE REQUIRED	7B	PATCH	SD	DATA/DOCUMENT
1C	UNABLE TO RECREATE	4A	WAIVER REQUIRED	7C	NEW GFE REQUIRED	SE	ENVIRONMENT
1D	RECREATE TOO COSTLY	4B	WAIVER AND OPNOTE REQD	7D	GFE RELEASE NOTE	SH	HUMAN
2A	MOD BUILD/FIELD FIX	4C	FIX WITH NEXT MODULE CR	7E	GFE WAIVER	SI	INTERFACE
2B	PATCH/SPF INDV MOVR	4D	FUNCTION NO LONGER USED	7F	FIX AUTO LOAD OUTPT/SIM	SL	LOGIC/DSGN
2C	CSECT MOD/OFTMOV	4E	INSUFF DATA FOR ANALYSIS	7G	FIX PREPROCESSR OTPT/SIM	SR	REQUIREMENT
2D	FIX AUTOLD/COMP MOV	4F	ANOMALY (PROBLY NOT S/W)	7H	GFE OVERRIDE	SO	OTHER
2E	PSF LQ/PANEL UPD	4G	REQUIREMENT INTENT MET	7I	NASA ACTION REQUIRED		
2F	BUILD/CFEMMU MOD	4H	PERM WAIVER WITH NOTE	8A	SOURCE MODE		
2G	PROCEDURE FIX	4I	CLASSIFIED DISPOSITION	8B	PATCH/SPF INDV MOVER		
2A	NO RQMT/INT APPL/YUSR ERR	4J	NO FIX INTENDED BY PR	8C	OTHR ACT REQD; OFT MVR		
3B	DUPLICATES OTHER PR	4K	REDELIVERY REQUIRED	8D	NO ACTION REQUIRED		
3C	NEW RQMT-CODE CHNG	5A	SYSTEM DELETED	8E	WAIVER		
3D	MOD RQMT TO MATCH CODE	6A	DEFERRED TO NEXT SYSTEM	8F	WAIVER AND OPNOTE REQD		
3E	HW,SETUP,SUPPORT SW	6B	DEFERRED FROM PREV SYSTM				

TEST/OP		PREVAIL CONDITN		RECUR CNTL		MATERIAL		MISC CODES		
IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	
A	ATP	ACCEPTANCE TEST	C	EM	EXPL	A	CIRCT	D	DIE	
AI	ATI	1ST ATP	E	ENVIRONMENT	1	DES	B	CIRCB	E	EL C/W
AS	ATS	SUBSEQUENT ATP	F	FUNCTIONAL	2	MFG	C	EEE	F	INSUL
D	DEV	DEVEL TEST	FC	CALIBRATION	3	F/TE	CA	DEVICE	G	SOLDER
F	FLT	IN FLIGHT	L	LIFE TEST	4	TEST	CB	EXT LD	H	WELD
L	FLD	FLD PREUSE	N	INSPECTION	5	TRNG	CC	PACKG	J	FINISH
LF	FDL	FIELD OMRSD PREUSE	P	PRESSURE	6	MNTN	CD	METAL	K	BOND
LL	FDL	FIELD LAB PREUSE	Q	THERMAL VAC	7	LTC	CE	COATG	L	FASTNR
M	MFG	MANUFACTURING	R	STORAGE	8	SHIP	CF	DRESS	M	LNKG
MI	MFG	MANUF-INITIAL BUILD	S	SHIPPING	9	GSE	CH	WIRE	N	HOLE
MO	MAN	MANUF-DEPO MAINTENANCE	T	THERMAL	A	PURG	CH	CONCT	P	SEAL
P	PFT	FIELD POSTUSE	V	VIBRATION	B	WAIV	CJ	PROCSS	Q	LUBE
PF	PFF	FIELD OMRSD POSTUSE	X	ALERT			CK	EPOXY	R	FLUID
PL	PFL	FIELD LAB POSTUSE					CL	DI ATT	S	STRUCT
Q	QAL	QUAL OR CERT TEST					CN	SPRING	T	SSTRT
X	ALE	ALERT					CP	BD PAD	W	RMEDIA
							CQ	MARG	X	SWARE
							CR	BEARG	Y	OPERN

10. USING MSFC UNIX PRACA (3 of 8)

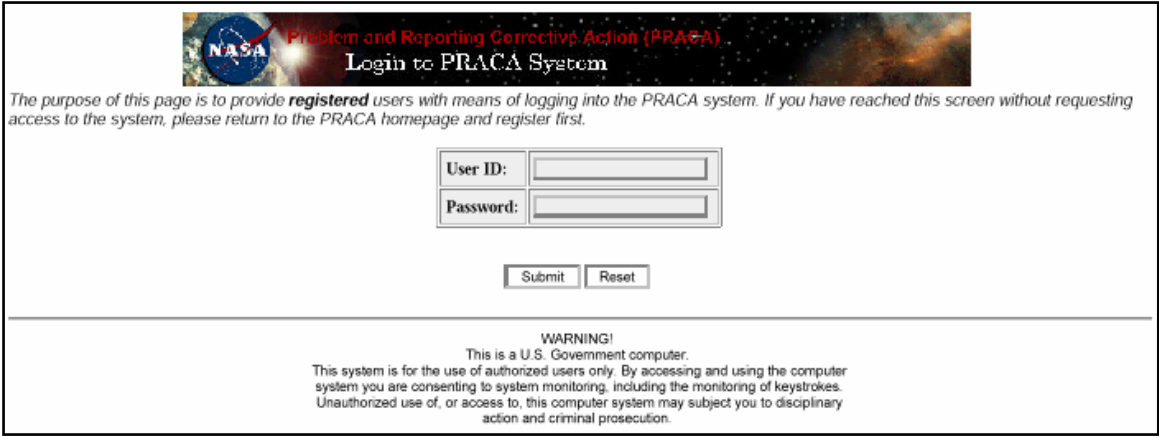
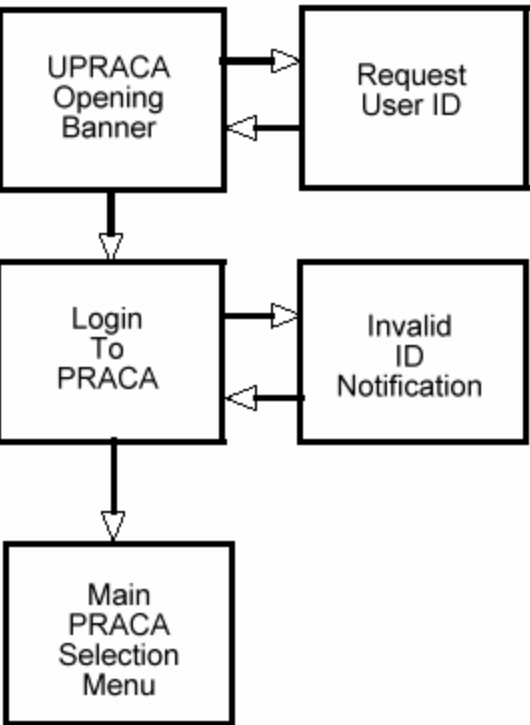
➤ MSFC UNIX PRACA Screen Flow Overview

<https://praca.msfc.nasa.gov/praca/review/public/html/>



➤ MSFC UNIX PRACA Screen Flow – MSFC PRACA Initial Access

- Office of S&MA PRACA System:
 - <https://praca.msfc.nasa.gov/praca/review/public/html/>
 - Request System Access
 - Login to PRACA



➤ MSFC UNIX PRACA Screen Flow – Main Menu Select Options

- Administrative Level = Administrator Options
 - Add Record
 - Update Record
- Administrative Level = User Options
 - Query By Search Criteria
 - Query By Report Number List
 - Query By String Search
 - Open Closed Summary Report
 - Open Problem Tabulation For All Elements
 - Open Problem Tabulation For A Specific Element
 - SSME PRB Document Generation Report

MSFC PRACA Main Menu

You have **User** privileges on this system. This allows you to inquire about records in the database.

User ID:	whitel
Admin Level:	User

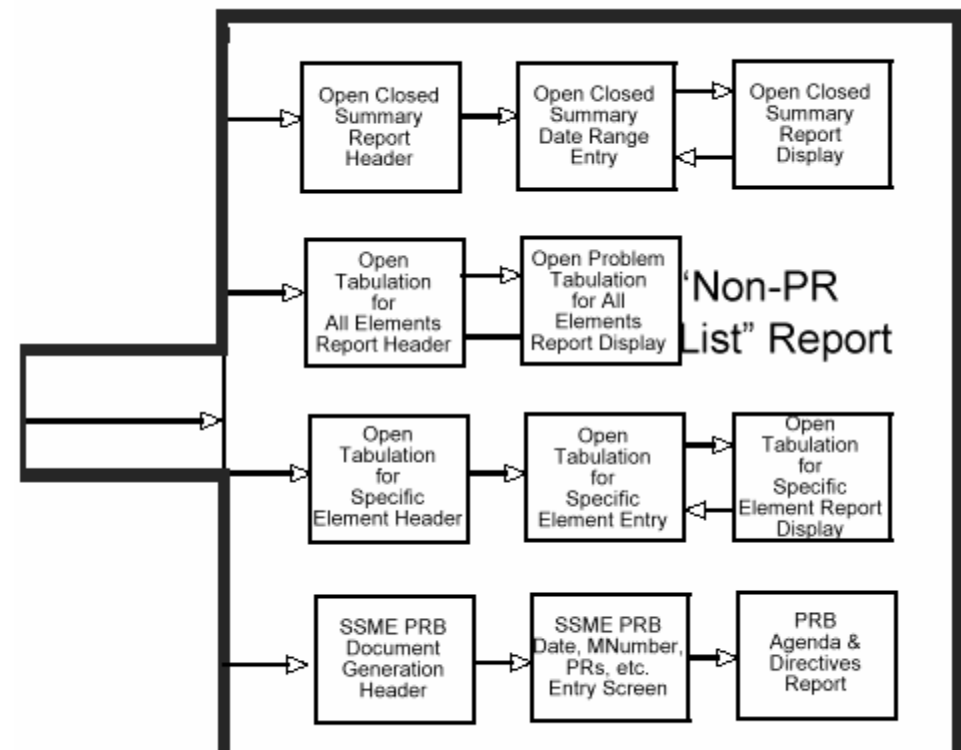
Select Usage From Listing Below

[Select an Item]

Last updated: Jun 7 2000 15:13:21.

➤ **MSFC UNIX PRACA Screen Flow – Non PR List Reports**

- Open Closed Summary Report
- Open Problem Tabulation For All Elements
- Open Problem Tabulation For A Specific Element
- SSME PRB Document Generation Report



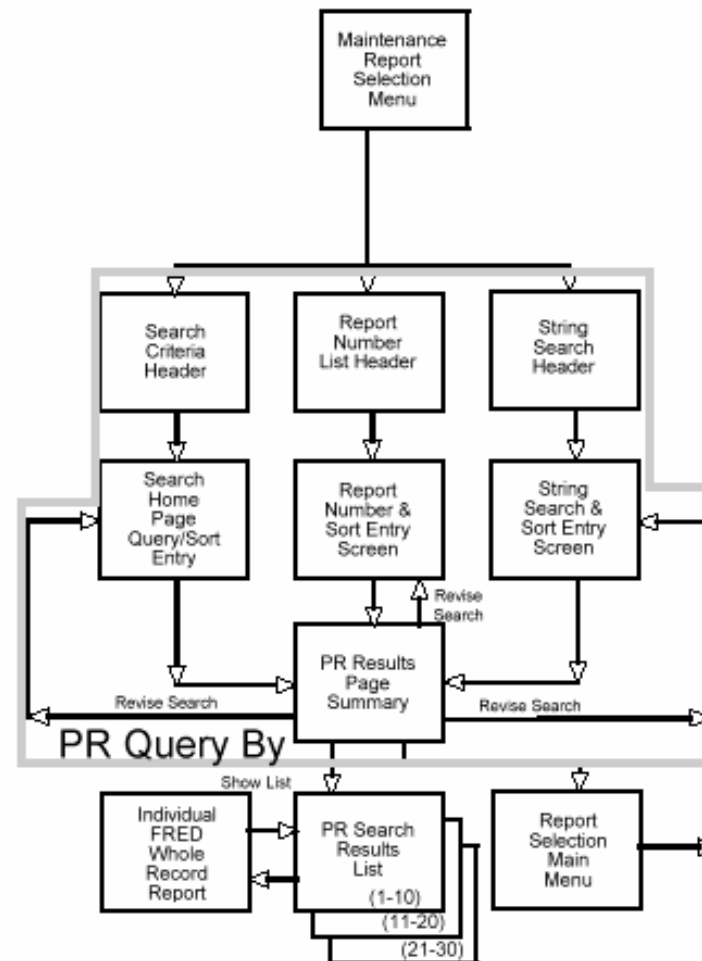
10. USING MSFC UNIX PRACA (7 of 8)

➤ MSFC UNIX PRACA Screen Flow – PR Query By Options

- Query By Search Criteria
- Query By Report Number List
- Query By String Search

➤ Matching PR List

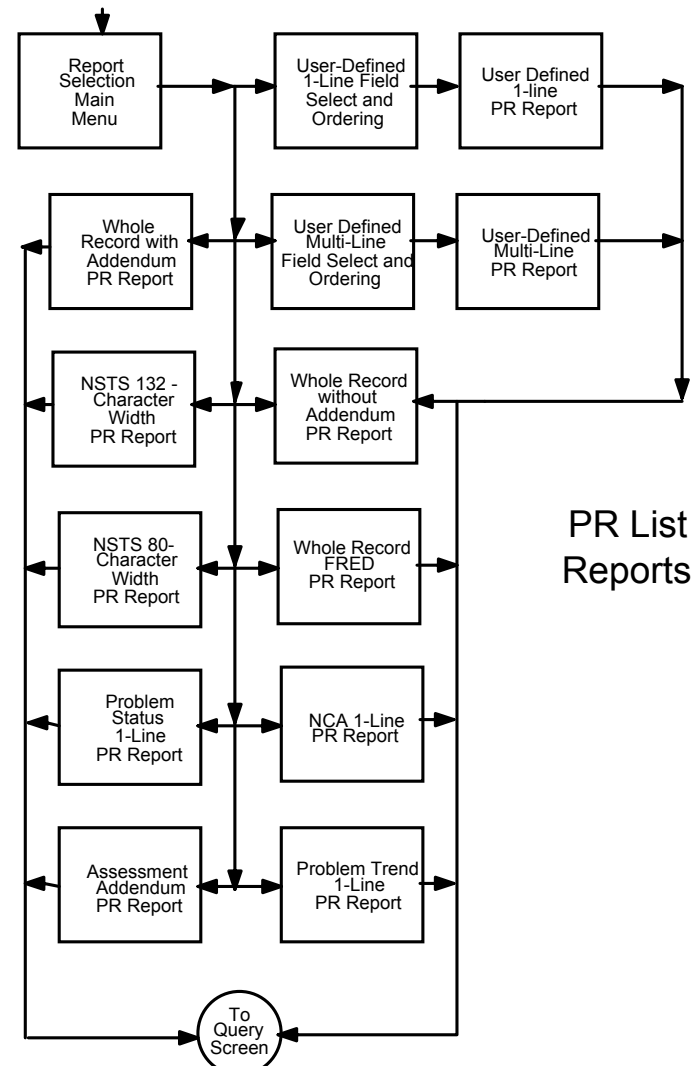
➤ Individual PR Quick Look (FRED Whole Record)



10. USING MSFC UNIX PRACA (8 of 8)

➤ MSFC UNIX PRACA Screen Flow – PR List Reports

- User-Defined 1-Line Report
- User-Defined Multi-Line Report
- Whole Record Without Addendum
- Whole Record With Addendum
- Whole Record FRED Report
- NCA 1-Line Report
- Problem Trend 1-Line Report
- Assessment Addendum Report
- Problem Status 1-Line Report
- NSTS 80-Character Width Report
- NSTS 132-Character Width Report



11. DATA MINING AND TRENDING

➤ Data Mining

- “A new discipline lying at the interface of statistics, data base technology, pattern recognition, and machine learning, and concerned with secondary analysis of large data bases in order to find previously unsuspected relationships, which are of interest value to their owners.” [Hand, American Statistician, 1998]
- Multi-variable correlation to allow the data to lead to determination of previously unknown relationships between seemingly un-related parameters.
- Includes data extract techniques, trending, and engineering analysis.
- “A comprehensive prescriptive data mining program is not feasible at this point in the SSP.” [Don Totton, SSP S&MA Panel, 07/19/2004]

➤ Trending

- Performing single-variable analysis on a given set of known or suspected common data to determine common historic traits
- Commonly used for statistical process control, data summary, and/or predictive analysis